INFLUENCES OF COMBINED APPLICATION OF ORGANIC AND INORGANIC FERTILIZATION RATES WITH MULTI-BIOFERTILIZER ON POTATO UNDER INTEGRATED WEED MANAGEMENTS

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ABSTRACT

The complementary effects between different rates of inorganic and organic fertilization in the presence of multi-biofertilizer and integrated weed managements on tuber yield of potato and associated weeds were studied in two successive seasons in sandy soil. The initial biofertilization, raised the counts of phosphate dissolving bacteria, *Azotobacter* spp., *Azospirillum* spp. and *Pseudomonas* spp. in potato rhizosphere receiving organic manure, compared to chemical fertilizer application under different weed control treatments. Associating biofertilizer with 75 or 50% farmyard manure (FYM) and 25 or 50% NPK fertilization under hand hoeing application respectively, acquired always higher counts of tested microorganisms. The results indicate that the highest number and dry weight of weeds were exerted by using 75% FYM and 25% NPK compared to other fertilization treatments. Application of half rate of metribuzin herbicide and supplementary by one hand hoeing was the master weed control treatment and produced the highest tuber yield. Addition of fertilizing necessity to potato plants as 50% from organic source (FYM) and 50% from inorganic fertilizer (NPK) along with biofertilizer produced the greatest number of tubers per plant, tuber weight and tuber yield with 6.3, 26.3 and 41.7% increases over the standard treatment (100% NPK). Application of 50% FYM + 50% NPK along with biofertilizer recorded the highest values of N, P and K % in potato tubers under different weed control treatments. Generally, under the conditions of the complementary fertilization (50% FYM+ 50% NPK) in the presence of biofertilizer and integrated weed control method (half rate of metribuzin + one hand hoeing), led to maximum tuber yield of potato.

INTRODUCTION

Chemical farming allowed us to make giant strides towards raising agricultural production and satisfying growing human needs. At the same time, the extensive worldwide abuse of agrochemicals, led to a set of successive environmental deterioration problems, as well as to agricultural unsustainability. These negative impacts might be contained through farming system which aims to avoiding the routine use of agrochemicals and reducing their rates of application (Saber, 2001). In addition, the continued application of mineral fertilizers without the addition of organic matter will eventually leave a dead compacted soil vulnerable to erosion (Sen *et al.,*1994).

It is will known that addition of organic manure has shown considerable increase in crop yield and exert significant influence on physical, chemical and biological properties of soil. But its use alone is not sufficient to meet the requirement of nutrients to achieve the best productivity from crop.

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Therefore, the use of both bio-organic fertilization and chemical fertilizers in appropriate proportion assumes special significance as complementary and supplementary to each other in crop production. Hence present experiment was undertaken to study the effect of organic manure, biofertilizer and chemical fertilizers, alone and in combination with each other on potato and associated weeds. The nutrient requirements of potato crop is quite high due to sparse root system and its capacity to produce large amount of dry matter per unit area. In this respect, Hussein and Radwan (2002) found that application of chicken manure alone instead of chemical fertilizer significantly decrease the tuber yield per feddan by 38.3%.

Nowadays emphasis has already been placed on the application of a gathered group of soil microorganisms, having definite beneficial well-known role in supporting plant growth and in developing sustainable soil fertility. Aly *et al.* (1999) reported that about half of the applied N fertilizer could be saved if wheat grains were inoculated with non-symbiotic fixing bacteria, without seriously affecting yield. El-Gamal (1996) found that inoculation of tuber seeds with multi strains biofertilizers caused a significant increment in exportable and total tuber yield of potato. Gallandt *et al.* (1998) found that greater reliance on organic nutrient sources and less reliance on synthetic fertilizer sources can benefit weed management. On the other hand, manure application may affect weed population dynamics. Mt Pleasant and Schlater (1994) reported that 1kg of caw manure can contain up to 42 (apparently viable) seeds of lambsquarters *(Chenopodium album* L.). Presence of weeds associated with potato plants all season caused a significant reduction in tuber yield per feddan by 51% (Shehata *et al.,* 1991). Metribuzin herbicide is a recommended herbicide in potato fields, has a broad spectrum on broadleaf and grass weeds, but its use has led to increase populations of metribuzin tolerant and resistant weed species (Eberlein *et al.*, 1997). In addition, metribuzin may persist in soil to injure cereal crops grown in rotation with potato.

Recent concern emphasis on using the low -rate herbicide with one hand hoeing for weed control in potato. Lanini and Le Strange (1991) reduced pre-emergence herbicide rates and when this was coupled with a single hand weeding, vegetable yields were equivalent to or better than of the full-rate herbicide or season long hand weeding. Hand hoeing combination with herbicides at reduced rates may increases the spectrum of weeds controlled and decreased the risk of inadequate weed control.

Therefore, this study was carried out to investigate the complementary effects between inorganic with bio-organic fertilization and low rate herbicide with hand hoeing on some rhizosphere microorganisms, weeds, and yield of potato plants.

MATERIAL AND METHODS

Two field experiments were performed at El-Salhia, Sharkia Governorate, Egypt in 1999 and 2000 seasons. The experimental soil was sandy, having pH 7.9, E.C 1.08 mmhos/cm, organic matter 1.32%, total N

0.037, total P 0.016% and total K 0.018%. A split-plot design with three replicates was used. The fertilization treatments were assigned in the main plots, while the sub-plots were occupied by the weed control treatments. Plot size was 10.5^2 (3.5x 3) including 5 rows 70 cm width and 3 meters length.

The seed tubers of Nicola c.v. were planted at 25 cm apart on 19th January in both seasons of study. The treatments were as follows:

I- Fertilization treatments:

1- 75% FYM + 25% NPK
2- 75% FYM + 25% NPK + biofertilizer
3- 50% FYM + 50% NPK
4- 50% FYM + 50% NPK + biofertilizer
5- 75% NPK + biofertilizer.
6- 50% NPK + biofertilizer
7- Chemical fertilizer (100% NPK)

I – Weed control treatments

1- Unweeded check.
2- Hand hoeing, three times at 21, 45 and 75 days after planting.
3- Metribuzin herbicide (Sencor, 70% WP at 300 g / fed., as a commercial product) applied as pre-emergence treatment (7 days after potatoes planting), before the 1st irrigation.
4- Metribuzin herbicide (Sencor, 70% WP at 150 g/fed.) applied as pre –emergence treatment (7 days after potatoes planting), before the 1st irrigation + one hand hoeing made after 6 weeks from planting (deephoeing, which involved weed removal from around the plants, and turning the soil from the non-planted side of the furrow over the bare stems of potato plants).

Farmyard manure (having total N 0.40%, P_2O_5 0.43% and K_2O 1.15%) has been added during soil preparation in organic fertilization plots according to analysis done on the same source, at rates (60 m^3/fed.) that were expected to supply the same amount of nitrogen to potatoes in plots received mineral fertilizer i.e. 200kg N/fed as ammonium sulphate (20.6% N), 46.5 kg P_2O_5/fed as calcium superphosphate (15.5% P_2O_5) and 90 kg K_2O/fed as potassium sulphate (48% K_2O).

Preparation and application of biofertilizer

Multi biofertilizer (phosphate dissolving bacteria (PDB), *Azotobacter* spp., *Azospirillum* spp. and *Pseudomonas* spp.) was prepared by mixing highly efficient local strains in equal amounts of each strain broth after separately grown in specific nutrient broth for 48 hours at 30°C in a rotary shaking incubator. Liquid broth cultures initially containing 9 $x10^8$, 2 x 10^8, 5 x 10^8 and 3 x 10^8 viable cell/ ml of PDB, *Azotobacter* spp., *Azospirillum* spp. and *Pseudomonas* spp., respectively. Peat moss was used as a carrier for multi-biofertilizer. Tuber seeds of potato were biofertilized directly before planting irrigation by added multi-biofertilizer carrier as bundling on tuber seeds in rows. Some tubers were retained non-biofertilized.

Enumeration of microorganisms

After 20, 40, 60 and 80 days from planting, the counts of phosphate dissolving bacteria (PDB), *Azotobacter* spp., *Azospirillum* spp. and *Pseudomonas* spp. in the rhizosphere of potato plants were enumerated under different fertilization treatments with various weed control methods. The serial dilution plate method was used for counting PDB on modified Bunt and Rovira medium (Abd El-Hafez, 1966) and *Azotobacter* spp. on modified Ashby's medium (Abd El-Malek and Ishac, 1968). The most probable numbers was used for counting *Azospirillum* spp. on semi-sold malate medium (Dobereiner *et al.,* 1976) and *Pseudomonas* spp. on KB medium (Sands and Rovira, 1970).

Data recorded

Weeds were collected randomly from one square meter (m^2) at 50 and 80 days after planting (DAP) and number and dry weight of each weed species were recorded.

At harvest, number and weight of tubers per individual plants, tuber weight and diameter, specific gravity (by weighting tuber in air and water) and total soluble solids percentage (T.S.S. %, using hand Refractometer) were determined.

$$\text{Percentage of tuber grade A} = \frac{\text{\% yield of tuber grade A per plot}}{\text{total tuber yield per plot}} \times 100 \quad)$$

based on tuber diameter (more than 3.5 cm with no defects and total tuber yield (t/fed.)were recorded. Nitrogen, phosphorous and potassium elements contents (%) of tubers after maturing were determined (A.O.A.C., 1984).

The obtained data were subjected to the analysis of variance according to Snedecor and Cochran (1990). L.S.D. at 5% level of significance was used to compare between means.

RESULTS AND DISCUSSION

1- Densities of tested microorganisms in rhizosphere of potato plants

Counts phosphate dissolving bacteria (PDB), *Azotobacter* spp., *Azospirillum* spp. and *Pseudomonas* spp. in the rhizosphere of potato plants under the combined application of organic and inorganic fertilization rates in the presence and absence of biofertilizer with integrated weed control managements are illustrated graphically in Figs. (1,2.3 and 4).

The initial biofertilization, raised the counts of PDB, *Azotobacter* spp., *Azospirillum* spp. and *Pseudomonas* spp. in potato rhizosphere receiving organic manure, compared to chemical fertilizer application under different weed control treatments. This result may be attributed to that organic manuring is important as a source of energy and nutrient elements for soil and improve the biological, chemical and physical properties of soil which in turn more balanced medium for the growth of microorganisms.

fig1

fig2

fig3

fig4

Biofertilized rhizosphere under associative action between FYM and NPK at rates (75% FYM + 25% NPK) contained higher densities of *Azotobacter* spp. and *Azospirillum* spp. , while at rates (50% FYM + 50% NPK) recorded higher densities of PDB and *Pseudomonas* spp. under different weed control treatments.

Concerning the effect of different weed control managements on tested microorganisms, hand hoeing alone or with half rate metribuzin herbicide treatment recorded higher counts of applied microorganisms in biofertilized rhizosphere compared to full rate of metribuzin herbicide or unweeded check treatments. These results could be attributed to that using half rate of metribuzin herbicide with one hand hoeing did not exert marked depressive effect on the tried microorganisms, but on the contrary it seemed stimulate the growth of microorganisms. Similar results were reported by Shams El-Din and Abdrabou (1995). While the depressive effect of weed infestation on the counts of tested microorganisms may be due to the effect of weed roots toxins (Eberlein *et al.*, 1997). In general, associating biofertilizer with 75 or 50% organic source (FYM) and 25 or 50% inorganic fertilization (NPK) under hand hoeing application respectively, acquired always higher counts of tested microorganisms.

2- Weeds

The experimental field was infested mainly with broad-leaved weeds, viz. purslane (*Portulaca oleracea* L.), bureclover *(Medicago hispida* Gaertn*)* and Lambsquarters *(Chenopodium album* L.), while the two narrow leaved weeds were ryegrass (*Lolium multiflorum* Lam.) and nut sedge (*Cyperus rotundus* L.).

2.1. Effect of fertilization treatments

As shown in Table (1) the lowest number of weeds recorded at 50 days after planting was obtained by using chemical fertilizer, while the highest number was noticed with 75% FYM+ 25% NPK+ biofertilizer treatment. In the main time, the latter treatment recorded the largest dry weight of weeds (18.5 g/m^2). These results might be due to that manure application increased the number of weed seeds in soil (Stevenson *et al.,* 1998). Zimdahl, 1999 reviewed a number of studies and showed that about 20% of the seed of certain weed species are still viable after their passage through cattle (*Bos* sp.), storage, and manure application.

Concerning the data collected at 80 days after planting, results in Table (2) reveals that using 75% FYM+ 25% NPK as a fertilizer sources exerted the highest number and dry weight of weeds, while the lowest was observed with chemical fertilizer (100% NPK) application. Data also show that the maximum number and dry weight of narrow leaved weeds were obtained with application of 75% FYM+ 25% NPK+ biofertilizer treatment.

2.2. Effect of weed control treatments

Numbers and dry weights of weed species and their total were significantly decreased by the three weed control treatments (Tables 1 & 2).

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These results were true at 50 and 80 DAP, except dry weight of ryegrass and nut sedge weeds at 50 and 80 days after planting, respectively. Excellent weed control efficiency at 80 DAP was achieved by the application of half rate of metribuzin herbicide and supplementary by one hand hoeing made after 6 weeks from potatoes planting. This complementary treatment caused a significant reduction in the total number and dry weight of weeds amounted by 80.3 and 81.8% at 50 DAP and by 83.8 and 90.4% at 80 DAP, respectively, compared to unweeded check treatment. Application of metribuzin herbicide at full rate (300g/ fed) led to significant decrements in total number of weeds by 58.6 and 76.4% and total dry weight of weeds by 51.5 and 79.0% at 50 and 80 days after planting, respectively. Confirming results on the efficiency of metribuzin on potato weeds were obtained by Renner and Powell(1998) and Mercer *et al.* (1999).

Metribuzin (half rate) + one hand hoeing treatment was the master treatment in this trial, gave 89.2, 93.0, 94.1 and 92.2% reduction in number of purslane, bureclover, lambsquarters and total broad leaved weeds, respectively. In addition, the dry weight of ryegrass and narrow leaved weeds were significantly reduced by this treatments amounted by 91.6% and 48.2%, respectively, compared to undweeded control. Superiority of this treatment against potato weeds could be attributed to the efficiency of herbicide on many weeds. On the other hand, weeds which may resist the toxic effect of the herbicide can be easily removed by the additional hoeing. Similar findings on the complementary effect between half dose of herbicide and hoeing were reported by Lanini and LeStrange (1991) and Nadagouda *et al.* (1996)

2.3. Effect of the interaction

The data in Table (1&2) indicate that number and dry weight of weed species and their total were insignificantly influenced by the interaction between fertilization and weed control treatments, consequently the data were excluded.

3- Yield and quality of potato tubers

3.1. Effect of fertilization treatments

The results in Table (3) show that number of tubers /plant, tuber weight, tuber yield per plant and per feddan and percentage of tuber yield (grade A) were significantly influenced by the different fertilization treatments. However, no significant differences were detected among the fertilization treatments on tuber diameter and specific gravity and total soluble solids of tubers.

Addition of nutrients demand to potato plants as 50% from organic source (farmyard manure) and 50% from inorganic fertilizer (NPK) along with biofertilizer produced the highest number of tubers /plant, tuber weight, tuber yield per plant and per feddan with 6.3, 26.5, 34.4 and 41.7% increases over the standard treatment (100% NPK), respectively. These increments might due to that organic manure play an important role in sandy soil as a result of improving their physio-chemical and biological properties, as well as the most important features of biofertilizers in relation to plant growth.

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In this respect, Sharma *et al.* (1988) reported that there were highly significant responses of potato to organic manures and nitrogen. In the absence of N, the FYM doubled the yield of large tubers but increased the yield of small grade tubers by about 40%. They added that, the difference between the manural and non-manural treatments on the yield became negligible at 120kg N/ha. Kostyuk (1998) found that the highest tuber yield (45 t/ ha) was obtained by application of 60-70 t cattle manure/ ha in conjunction with 120-130 kg/ha from each N, P and K. While Lapa and Ivakhenko (1999) found that highest crop yield (23.5 t/ha) was achieved with the treatment of 60: 40: 120 Kg N: P:K/ha with 70 t cattle manure/ha. Data in Table (3) also indicate that fertilization potato plants by 75% organic source (FYM) + 25% inorganic source (NPK) plus biofertilizer increased tuber weight and significantly increase the tuber yield per plant and per feddan by 18.2, 14.3 and 9.1%, respectively compared to chemical fertilizer (100% NPK). However, this treatment exhibited lower values of these criteria, as compared to the treatment of 50% FYM+ 50% NPK plus biofertilizer by the amount of 6.5, 14.9 and 23.0%, respectively. The superiority of the complementation fertilizer treatment (50% organic + 50% inorganic along with biofertilizer) than other treatments might be due to the complementary effects between organic and inorganic sources in the fertilizer given to plant, positively affected yield and yield components as a result of supplies soil with macro-and micro-nutrients, so improves nutritional balance in the soil which affects the relationship between plant and soil. Generally, when the biofertilizer, was added to the organic fertilizer, the dry matter content increased in plant tissues. Vadavia *et al.,*1991 came to the same conclusion concerning chick pea.

Regarding the effect of biofertilization, data in Table (3) show that the inoculation of tuber seeds gave insignificant increases in number of tubers /plant and tuber yield per plant and per feddan by amount 8.1, 5.9 and 5.9%, respectively when added to the treatment of 75% FYM + 25% NPK. While these improvements were amounted by 4.1, 4.4 and 7.2%, respectively when using the nutrient in half between inorganic and organic fertilizer sources. The enhancement in tuber yield might be due to that asymbiotic nitrogen fixation bacteria make towards crop growth through nitrogen input and secreting plant growth promoting substances as well as mineralization of certain macro-and micro nutrients by phosphate dissolving bacteria which in turn increase the dry matter accumulation and total yield (Osman, 1998 and Saber, 2001).

On the other hand, the addition of 75% or 50% chemical fertilizer alone to biofertilized plants produced tuber yield per feddan less than other fertilization treatments. This result may be attributed to the negative impact of the high doses of mineral fertilizer on rhizosphere microorganisms, especially the N-fixing bacteria which may mutate into non-fixing forms (Welborn, 1982). In addition, the absence of organic manure and its negative effect on biological activity of microorganisms, which , in turn increase the availability of minerals in plant tissues and producing of tuber yield.

From the previous results, it can be concluded that the maximum tuber yield can be obtained by using half as organic source (FYM) and the rest (half) of the recommend dose of NPK as chemical along with biofertilizer under various weed control treatments.

3.2. Effect of weed control treatments

Allowing weeds to grow with potato plants (in unweeded plots) all season, caused a significant reduction in number of tubers/ plant, tuber weight, tuber yield per plant, tuber yield grade A (%) and tuber yield per feddan by about 52.4, 14.5, 59.3, 51.1 and 53.4%, respectively, compared to hand hoeing treatment. Controlling weeds by hand hoeing, metribuzin (full rate) and metribuzin (half rate) + one hoeing resulted in a significant increases in tuber yield per plant by about 145.8, 138.8 and 162.1%, over the unweeded treatment, respectively. Successful weed control treatments reduced below and above ground competition which potato plants suffer and consequently favoured growth of potato plants, increase their photo- synthetic capacity and this in turn increased the amount of metabolites synthesized by potato plants and their translocation and accumulation in plant sink to increase growth, yield and yield attributes of potato plants (Fayed *et al.,* 1992).

No significant difference were noticed in the tuber yield /plant and per feddan between hand hoeing and metribuzin (full rate) treatments as well as between hand hoeing and the complementary treatment (half rate of metribuzin + one hoeing).

As shown in Table (3) using half rate of meteribuzin herbicide and addition of one hand hoeing significantly increased the tuber weight than the other weed control treatments. Otherwise, the superior treatment exceeded that of hand hoeing, metribuzin (full rate) and that of unweeded treatments in total tuber yield per feddan by 7.6, 12.4 and 130.7%, respectively. These results agreed with the findings on hoeing by Eberlein *et al.,* (1997), on half rate of herbicide + one hand holing by Ghosh (1998) and on full rate of meteribuzin treatment by Mercer *et al.* (1999) and Hussein and Radwan (2002).

The results presented in Table (3) indicate that application of hand hoeing treatment gave the highest percentage of tuber yield (grade A) which increased over the unweeded treatment by 104.5%. Similar results were found by Qadir *et al.* (1999). Bellinders *et al.* (1996) reported that cultivation reduces tuber exposure to sunlight, which reduced tuber greening. The data in Table (3) also show that weed competition had no significant effects on diameter, specific gravity and total soluble solids (T.S.S) of tuber. Zarzecka *et al.* (1997) mentioned that weed control treatments did not effect the total sugar content of potato tubers.

3.3. Effect of the interaction

The interaction between fertilization and weed control treatments had no significant effects on diameter, weight, specific gravity and total soluble solids of tuber, therefore the data are not mentioned here. On the other hand, number of tubers/plants, percentage of tuber yield grade A and tuber yield were significantly affected by this interaction (Table 3).

Concerning the number of tubers/plant, results in Table (4) show that the highest number of tubers per plant was obtained by addition 50% FYM+ 50% NPK plus biofertilizer and controlling weeds by metribuzin (full rate), while the lowest number was recorded under 50% NPK + biofertilizer alone under unweeded treatment. The highest percentage of tuber yield grade A was achieved by the combination of 75% FYM +25% NPK plus biofertilizer and elimination of weeds by half rate of metribuzin combined with one hand hoeing.

Regarding the tuber yield, data in Table (4) reveals that the greatest tuber yield was produced under the conditions of the complementary fertilization (50% FYM+ 50% NPK) along with biofertilizer and integrated weed control method (half rate of metribuzin + one hand hoeing). These results are expected, since, each single factor gave the highest tuber yield per plant and per feddan (Table 3). This master interaction treatment exceeded that of the chemical treatment (100% NPK + metribuzin herbicide at full rate) in tuber yield per plant and per feddan by 45.2% and 86.3%, respectively.

4-Nutrients content in tubers

4.1.Effect of fertilization treatments

Results presented in Table (5) revealed that no significant differences were calculated in N, P and K contents of potato tubers as a result of biofertlization under either 75% FYM + 25% NPK or 50% FYM + 50% NPK application compared to chemical fertilizer (100% NPK). Application of 50% FYM + 50% NPK along with biofertilizer recorded the highest values of N, P and K %in potato tubers under different weed control treatments. This result may be attributed to the response to organic manure was affected by the use of N and the differences between the non-organic and organic manurial treatments were larger in the absence than in the presence of N (Sharma *et al.* ,1988). On the other hand, the relative prices and availability of fertilizer and organic manure, in the amounts needed at the place and time of requirement, will determine the economic benefits and any cost savings (Sharma and Sharma,1988).

4.2. Effect of weed control treatments

Differences calculated in N and P contents of tubers between hand hoeing or half rate of metrbuzin herbicide + one hand hoeing application were significant if compared to unweeded check treatment (Table 5). It could be state that, weeds associated with potato plants may reduce the plant growth and N &P contents of potato tubers, since weed more competitors for nutrients uptake as compared with domestic plants. Similar conclusion have previously obtained by Bainade and Potel (1991). On the other hand, no significant differences were found in K content between studied weed control treatments.

4.3. Effect of interaction

Data in Table (5) illustrate that the interaction between fertilization treatments and weed control managements had no significant effect on tuber macro-nutrient contents. These results means that fertilization and weed control treatments act independently to the tubers nutrient content.

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Table (5): Macro-nutrients content in potato tubers as affected by fertilization and weed control treatments (Combined analysis of the two seasons).

Treatments	Macro-elements (%)		
	N	P	K
Fertilization treatments			
75% FYM + 25% NPK	1.51	0.19	1.73
75% FYM + 25% NPK + biofertilizer	1.32	0.16	1.75
50% FYM + 50% NPK	1.34	0.25	1.82
50% FYM + 50% NPK + biofertilizer	1.41	0.31	1.83
75% NPK + biofertilizer	1.22	0.14	1.70
50% NPK + biofertilizer	1.48	0.26	1.78
100% NPK (control)	1.53	0.29	1.84
L.S.D. at 5%	0.21	0.07	N.S.
Weed control treatments			
Unweeded check	1.12	0.14	1.72
Hand hoeing	1.22	0.23	1.81
Metribuzin (300 g /fed.)	1.19	0.18	1.78
Metribuzin (150 g /fed) + one hoeing	1.24	0.21	1.75
L.S.D at 5%	0.10	0.05	N.S.
L.S.D for interaction	N.S.	N.S.	N.S.

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التأثيرات المشتركة لمعدلات التسميد العضوى وغير العضوى مع مخصب أحيائى متعدد السلالات على محصول البطاطس تحت نظم المكافحة المتكاملة للحشائش

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أجريت تجربتان حقليتان فى موسمين متعاقبين(١٩٩٩و٢٠٠٠) لدراسة التأثيرات المكملة لبعضها البعض والناتجة من استخدام معدلات مختلفة من التسميد العضوى وغير العضوى فى وجود مخصب أحيائى متعدد السلالات مع استخدام معاملات مكافحة الحشائش المتكاملة على محصول درنات البطاطس والحشائش المصاحبة له فى أرض رملية.

وتشير أهم النتائج إلى :

- أدى التلقيح بالمخصب الأحيائى إلى زيادة أعداد كل من البكتريا المذيبة للفوسفات وبكتريا الأزوتوباكتر وبكتريا الأزوسبيريللم وبكتريا السيدوموناس فى منطقة ريزوسفير البطاطس المسمدة عضوياً، وذلك إذا ما قورنت بالتسميد الكيماوى تحت معاملات مكافحة الحشائش المختلفة.
- سجلت البكتريا المستخدمة تحت الدراسة أعلى أعداد لها عند مصاحبة المخصب الأحيائى للتسميد العضوى بمعدل ٧٥ أو ٥٠% سباخ بلدى مع السماد الكيماوى بمعدل ٢٥ أو ٥٠% على الترتيب، تحت مكافحة الحشائش بالعزيق اليدوى.
- أدى التسميد المشترك باستخدام (٧٥% سماد عضوى و ٢٥% سماد كيماوى) إلى ظهور أعلى الأعداد والأوزان الجافة للحشائش بالمقارنة بمعاملات التسميد الأخرى.
- أظهرت معاملة مكافحة الحشائش باستخدام نصف المعدل الموصى به من مبيد الحشائش متروبيزون مع إجراء عزقة يدوية واحدة، أعلى كفاءة لمكافحة الحشائش، وأعطت أعلى محصول درنات بالفدان.
- أدى توفير الاحتياجات السمادية لنباتات البطاطس بإضافة ٥٠% سماد عضوى مع ٥٠% سماد كيماوى فى وجود المخصب الأحيائى إلى الحصول على أعلى عدد درنات/ النبات ووزن الدرنة والمحصول الكلى للدرنات بالفدان بنسبة تفوق ٦,٣ ، ٢٦,٣، ٤١,٧% عند مقارنتها بمعاملة المقارنة (١٠٠% تسميد كيماوى).
- حققت معاملة التسميد مناصفة بين السماد العضوى والكيماوى فى وجود المخصب الأحيائى أعلى قيم لمحتوى النتروجين والفوسفور والبوتاسيوم فى درنات البطاطس تحت معاملات مكافحة الحشائش المختلفة.
- أدت معاملة التسميد المتكاملة – بصفة عامة – باستخدام ٥٠% سباخ بلدى+ ٥٠% سماد كيماوى فى وجود المخصب الأحيائى متعدد السلالات، مع مكافحة الحشائش بنصف المعدل الموصى به من مبيد الحشائش متروبيزون وعزقه يدوية واحدة ، إلى الحصول على أعلى محصول لدرنات البطاطس.